A study of this paper may perhaps throw some light on the corresponding problems in the manufacture of steel.

Mr. Larsen's paper on the Permanent Way of Street Tramways is an eminently technical production, and deals with the forms of rails and nature of sleepers and cross-ties necessary to secure not only a good and permanent road for the present system of traffic, but also one which can be readily adapted to steam traction, whenever sufficiently perfect steam traction shall have been introduced to take the place of horses.

Tramways have not hitherto succeeded in earning the sympathy of those sections of the public who travel in cabs and carriages. Owing to the peculiar kind of rail used, and the imperfect manner in which the tramway proper has been combined with the paving of the ordinary road, street vehicles have experienced a very nasty and injurious species of wrench and jolt, when crossing the rails, which, besides being very uncomfortable to the occupier of the carriage, is also extremely injurious to his wheels. In addition to this drawback the earlier tramways were laid on a very bad system. They rapidly got out of order. Owing to the spikes which fastened down the rails having been driven down from the upper side, the rain used to percolate downwards between the spike and its holding in the sleeper, so that the wood of the latter became soft, and spike and rail consequently worked loose. In fact, in the older tramways it was the exception to find a rail in good order. The difficulty of setting the paving stones properly in the neighbourhood of the longitudinal timber sleepers was so great that the surface of the roadway almost invariably settled down thereabouts into a continuous longitudinal depression, which in wet weather became a stagnant ditch, not only unsightly, but extremely inconvenient to foot passengers and ordinary traffic. Mr. Larsen in his paper describes the various inventions and contrivances brought out by himself and other engineers for the purpose of remedying these drawbacks, and of making the permanent way so secure and rigid that it can be used at any time for steam traction.

The author does not refer to one of the greatest novelties in permanent-way construction, viz., the glass sleepers brought out by Mr. Lindsay Buckill and Mr. W. Siemens of Dresden. These sleepers have been laid down for some time past on a section of one of the Metropolitan tramway lines, and appear to have answered their purpose most successfully. The fact that glass, proverbially the most brittle of substances, could be used for such a purpose, might strike most people with surprise; but readers of Dr. Schott's paper, referred to above, will have learned that by suitable tempering glass may be made, mass for mass, stronger than steel, and practically unbreakable. We understand that the success attained in the construction of glass sleepers has recently been so great that it is now proposed to make broad longitudinal sleepers with a groove in the upper surface which shall combine in themselves the functions of rail and sleeper, and do away with the necessity for separate iron rails with their fastenings, joints, and other concomitant complications.

Mr. Henry Davey's paper on water-pressure engines for mining purposes would scarcely be understood without reference to the diagrams and illustrations made use of by the author. Its character is moreover so essentially technical as to render it unsuited for reproduction in this journal.

NOTES

We take the following from the *Times*:—The following are the names of the fifteen candidates for the Fellowship of the Royal Society selected by the Council and recommended for election (Thursday, June 3, is the day appointed for the election):—Dr. Clifford Allbutt, Prof. J. Attfield, Mr. H. E. Blanford, the Rev. W. H. Dallinger, Mr. Thiselton Dyer, Lieut.-Col. Godwin-Austen, the Bishop of Limerick, Prof. D. E. Hughes, Mr. H. M. Jeffery, Prof. F. M'Coy, Mr. J. F. Moulton, Prof. C. Niven, Dr. J. Rae, Prof. J. E. Reynolds, Dr. W. A. Tilden.

Prof. Bayley Balfour returned last week from Socotra, with considerable botanical and zoological collections made during his necessarily very brief visit. He obtained dried specimens of 500 species of flowering plants, and four cases of living specimens, besides a large plant of the *Dracæna*, which yields the dragon's blood of Socotra, and which, till recently, was quite unknown to science. He attempted to convey with him through Italy a small case of succulent plants of special interest, but it was stopped at the Custom House at Brindisi, and unless it finds its way to England by the sea route, its contents are of course lost.

We regret to learn of the death, after a short illness, of Mr. W. H. Holloway, F.G.S., of the Geological Survey of England and Wales.

The Portuguese Naturalist Anchietta has recently sent from Africa 2,000 specimens of birds and 1,000 reptiles, fishes, insects, and other animals, besides numerous specimens of plants and rare minerals. They are intended for the Polytechnic Museum of Lisbon.

The *Newcastle Chronicle* announces the death, at Gosport, of Mr. Thomas Atthey, a naturalist of considerable reputation. Although living in comparative obscurity and quiet, he was well known and highly esteemed in learned circles for his researches in and contributions to that branch of science to which he was so much attached, his position being very much akin to that of Thomas Edwards.

The *Irish Farmers' Gazette* understands that Prof. Baldwin is about to retire on a well-earned pension from the appointment he has so ably filled for many years as Superintendent of the Agricultural Department of the National Board, Dublin.

The Dharwar correspondent of the *Bombay Gazette* gives a graphic account of a thunderstorm which occurred on March 24 last, and was accompanied by a fall of some very heavy hailstones. "The storm," the correspondent states, "was ushered in by the fall of some extremely heavy hail, several of the largest stones, which were *spherical* in shape, measuring no less than *nine or ten inches in circumference*. He did not himself see these monster hailstones, but he vouches for the accuracy of this statement. He picked up several hailstones, however, himself, which were the size of Tangier oranges. Accompanying this storm of hail were thunder and lightning, both on a grand scale, the latter at times being very vivid. After the hail came a heavy downpour of rain, and the whole affair was over by about 8 p.m. One piece of ice was picked up about five inches long and pointed at one end." The correspondent who sends us this writes: "It is a pity that these remarkable hailstones were not more closely examined and measured. Of course there are cases on record of still larger stones having fallen, especially in tropical countries."

The programme of the annual meeting of the Iron and Steel Institute, to be held on May 5, 6, and 7, has just been issued. The Bessemer medal for 1880 is to be presented to Sir Joseph Whitworth, and among the papers to be read and discussed are the following:—"On Hardening Steel, its Causes and Effects;" "Physical Changes occurring in Iron and Steel at High Temperatures;" "Manufacture of Bessemer Steel and Ingot Iron from Phosphoric Pig;" "Dephosphorisation of Iron at the Hördeworks, Germany;" "Reactions in the Open-hearth Process;" "Improved Method of Utilising By-products in the

Manufacture of Cake;" and "Improved Apparatus for Analysing Blast Furnace and other Gases."

PROF. HUMPHRY, F.R.S., has been appointed Rede Lecturer for this year.

A RUMOUR has been spread in all the French papers and in some of our English contemporaries, that a war balloon had exploded at Meudon, and an officer with some privates severely wounded. We are happy to be able to state on official authority that this statement has no ground whatever, in spite of its precision.

M. BISCHOFFSHEIM, the well-known Paris banker, a native of Amsterdam, is to be naturalised, without being subjected to the usual formalities, as a compliment for his munificence towards scientific and other objects.

THE elections for the Superior Council of Public Instruction in France took place last week. The Institute sent five delegates, one from each class, the College de France two professors, the Museum of Natural History one, the Polytechnic School one, the Normal School two, the Conservatoire des Arts et Metiers one. The other delegates were selected all over France by the several delegations of private teachers voting by categories. The counting of these votes took place at the Ministry of Public Instruction. Amongst the delegates are M. Jules Simon, the former Minister of Public Instruction, M. Bertrand, the Perpetual Secretary of the Academy of Sciences, M. Fremy, the former President of the Academy of Sciences, M. St. Claire Deville, M. Berthelot, M. Hervé-Mangon the Director of the Conservatoire of Arts, and M. Laussedat, the former Director of the Meudon Aeronautical School.

THE *Daily News* states that we have to thank the heliograph again for an important message received from General Stewart, and announcing the result of an attack on our troops, in which the enemy seems to have suffered severely. The message is dated Camp Ghuzni, April 22, and was received at the India Office the following day. It is very probable that the news could not have been brought so speedily by electric telegraph. The heliograph does not require the route to be kept open. The line of communication cannot be cut, for the simple reason that the signalling takes place over the heads of the enemy, and the stations required are but few and far between. A 10-inch mirror, and this is the diameter of the ordinary field heliograph, is capable of reflecting the sun's rays in the form of a bright spot, or flare, to a distance of fifty miles, the signal at this interval being recognisable without the aid of a glass. That is to say, two trained sappers, each provided with a mirror, can readily speak to one another, supposing the sun is shining, with an interval of fifty miles between them, provided their stations are sufficiently high and no rising ground intervenes to stop the rays. The adjustment of the military heliograph is a very simple matter. An army leaves its base where a heliograph station is located, and after travelling some miles desires to communicate with the stay-at-homes. A hill in the locality is chosen, and a sapper ascends with his heliograph, which is simply a stand bearing a mirror swung like the ordinary toilet looking-glass, except that besides swinging horizontally it is also pivoted so as to move vertically as well. Behind the mirror, in the very centre, a little of the quicksilver has been removed, so that the sapper can go behind his instrument and look through a tiny hole in it towards the station he desires to signal. Having sighted the station by adjusting the mirror, he next proceeds to set up in front of the heliograph a rod, and upon this rod is a movable stud. This stud is manipulated like the foresight of a rifle, and the sapper again, standing behind his instrument, directs the adjustment of this stud until the hole in the mirror, the stud, and the distant station are in a line. The heliograph is then ready to work, and in order to flash signals so that they may be seen at a distance, the sapper has only to take care that his mirror reflects the sunshine on the stud just in front of him.

AN open competition for one situation of Junior Second Assistant in the Herbarium, Royal Gardens, Kew, will be held in London, under the following regulations, on Tuesday, May 25, 1880, and following days. No person will be admitted to the examination from whom the Secretary, Civil Service Commission, has not received, on or before May 15, an application on the prescribed form. The examination will be in the following subjects, viz:—(1) Handwriting, (2) Orthography, (3) Arithmetic (elementary), (4) Elements of Systematic and Structural Botany, (5) the naming of plants by the British Flora. Candidates will be required to show what preliminary training or technical education they have undergone to qualify themselves for a situation of this nature, and they must satisfy the Civil Service Commissioners that they possess the special qualifications necessary for the office. The salary of the Junior Second Assistant in the Herbarium is 100*l*. per annum, rising by annual increments of 10*l*. to 150*l*. per annum.

SHOCKS of earthquake were felt at Nice at 2 p.m. on Sunday.

THE Municipal Council of Paris have visited the peninsula of Gennevilliers, to ascertain the results of irrigation with the discharge from the sewers. These have been found splendid, and the agricultural population of the district is very well satisfied with them. Other lands are to be found for utilising the remaining part of the sewage of Paris. The city engineers proposed to irrigate land in the vicinity of the forest of St. Germain, but the inhabitants have sent petitions against the project, and deputations have met the Municipal Council. At all events, it is supposed the opposition will be overruled by the city authorities, unless Parliament vetoes the further extension of sewage irrigation.

NEWS has just reached Shanghai respecting the progress of the scheme for establishing a woollen manufactory at Lanchow-fu, in the extreme north-west of China Proper, to which we alluded about a year ago. Mr. Hagge, one of the foreigners employed at it by the Chinese Government, has just returned to Hankow and Shanghai; he states that no difficulty is experienced by the natives in working the machinery, and that the sheep's wool supplied is of the finest quality, a great deal of camels' wool also being used. It is perhaps worthy of note that the Chinese in that region live almost entirely on meat and wheat flour. Mr. Hagge's journey from Lanchow-fu to Hankow occupied fifty-two days.

FROM the *Japan Herald* we gather some particulars respecting the earthquake at Yokohama on February 22, the most serious one which has occurred in Japan since 1855. The Government some years ago, established the necessary apparatus at Tokio for registering the duration, force, *&c.*, of earthquakes, by which it appeared that the first shock took place at 0h. 49m. 22s. a.m., and lasted fourteen seconds; the second was at 0h. 50m 19s., and lasted only six seconds, but it was far more severe than the first, and did much damage. There was a third and less violent shock thirty seconds later, but no record is given of its duration. The index of the stenograph showed that the second shock was from N.N.W. to S.S.E., and the force of the shock was registered at 79 degrees.

THE *Report* of the Geological Association for 1879 complains, like the recent reports of other societies, of the few additions to its membership during the past year, no doubt mainly owing to the general depression. The Society now numbers 415 members.

FROM Tokio, Japan, we have received a little pamphlet on "Japanese, Metric, and English Weights and Measures," by Mr. Edward Kinch, compiled for the use of the students of the

Imperial Agricultural College of Tokio. The tables include mensuration and mechanical formulæ, and physical, chemical, and physiological memoranda and constants.

"NOTES on the Alluvial and Drift Deposits of the Trent Valley near Nottingham," is the title of a lecture to the Nottingham Naturalists' Society by Mr. James Shipman, published by Norris and Cokaigne, of Nottingham.

No. 1 of the *Transactions* of the Cremation Society of England has been issued by Smith, Elder, and Co.; it contains a short history of the subject of cremation at home and abroad, up to the date of the sixth anniversary of the Society, on January 13 of this year.

As proof that fat is formed from albumen, the affirmation of Blondeau (*inter alia*) is sometimes cited, that in the cellars at Roquefort the albumen of the cheese kept there is changed to fat by action of the fungus present This has been often doubted, and recently Herr Sieber has given (*Journal für praktische Chemie*, Bd. xxi. p. 203) experimental evidence of its falsity. He analysed fresh cheese, cheese that had remained one month in the cellar, and quite old cheese. His figures prove that the most marked change which cheese undergoes in ripening is the loss of water. The proportion of fat remains unaltered, if only the dry substance be considered. (The apparent increase of fat represented in the three percentage figures 27·41, 31·23, and 40·13 is due to drying.) The second essential change of cheese in ripening consists in the decomposition of albumen; the casein passes into a series of decomposition products, which are pretty similar to products of putrefaction in the first stages of putrefactive fermentation. But these analyses show no transformation of albumen into fat.

FROM a circular which has been sent us we learn that the "Studies from the Biological Laboratory of the Johns Hopkins University," will appear in parts from time to time as sufficient material accumulates; and will contain original papers upon Physiology, Animal and Vegetable Morphology, and Embryology, published by members of the University in different scientific journals, and other papers which are not printed elsewhere. The publication will be based upon the investigations made by members of the University in the biological laboratory, and in the marine zoological station of the University. Each part will contain about 100 pages, and four parts will make a volume. The first volume is now complete, and contains 519 pages, and 40 plates, besides illustrations in the text: with the following table of contents. Vol. I., part 1, contains:—The normal respiratory movements of the frog and the influence upon its respiratory centre of stimulation of the optic lobes, by H. Newell Martin. The development and regeneration of the gastric glandular epithelium during fœtal life and after birth, by H. Sewall. The influence of stimulation of the midbrain upon the respiratory rhythm of the mammal, by H. Newell Martin and W. D. Booker. The botanical relations of *Trichophyton tonsurans*, by I. E. Atkinson. Preliminary observations upon the development of the marine prosobranchiate mollusca, by W. K. Brooks. With four plates and three illustrations in the text; price 1 dollar. Vol. I. part 2, contains:—On the respiratory function of the internal intercostal muscles, by H. Newell Martin and Edward Mussey Hartwell. Observations on the physiology of the spinal cord, by Isaac Ott. On the effect of two succeeding stimuli upon muscular contraction, by Henry Sewall. On the so-called heat dyspnœa, by Christian Sihler. A self feeding chronograph pen, by H. Newell Martin. Observations upon the early stages in the development of the fresh-water pulmonates, by W. K. Brooks. The development of *Amblystoma punctatum*, by S. F. Clarke. With twelve plates; price 1 dollar. Vol. I. part 3 (Chesapeake Zoological Laboratory; scientific results of the session of 1878), contains:—Introductory, by W. K. Brooks. Land Plants found at Fort Wool, by N. B. Webster. List of animals found at Fort Wool, by P. R. Uhler. The development of Lingula, by W. K. Brooks. Lucifer typus, by Walter Faxon. The development of Gasteropods, by W. K. Brooks. The development of Squilla, by W. K. Brooks. With thirteen plates; price 1 dollar. Vol. I. part 4 contains:—The development of the American oyster, by W. K. Brooks. The acquisition and loss of a food-yolk in molluscan eggs, by W. K. Brooks. With eleven plates; price 1 dollar. The editors wish to exchange this publication with the publications of scientific societies and scientific journals. The publishers are J. Murphy and Co., Baltimore, Md., U.S.A.

THE *Revue Scientifique* for April 24 has a long essay by M. J. Thonlet, on the Mineralogy of Homer.

MR. MOSELEY asks us to state that in the report of his lecture on Deep-Sea Dredging and Life in the Deep Sea (NATURE, vol. xxi. p. 543), "Four-elevenths, or nearly three-fourths, should stand "eleven-fifteenths," κ.τ.λ.

THE additions to the Zoological Society's Gardens during the past week include a Cape Hunting-Dog (*Lycaon pictus*) from South Africa, presented by Mr. C. Ernest Pope; a Vulpine Phalanger (*Phalangista vulpina*) from Australia, presented by Capt. Fife; a Green-Winged Trumpeter (*Psophia viridis*) from Maranham, presented by Mr. R. M. Hyde; a Blue-fronted Amazon (*Chrysotis æstiva*) from South America, presented by Miss E. Bentley; a Black Scoter (*Œdemia nigra*), European, presented by Mr. J. E. Harting, F.Z.S.; a Long-Eared Owl (*Asio otus*). European, presented by Capt. C. A. Lumsden; a Stump-Tailed Lizard (*Trachydosaurus rugosus*) from Australia, presented by Capt. J. Thomas; a Common Adder (*Vipera berus*), British, presented by Mr. W. H. B. Pain; a Drill Baboon (*Cynocephalus leucophæus* from West Africa, deposited; two Common Seals (*Phoca vitulina*), British Seas, purchased; two Jameson's Gulls (*Larus jamesoni*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN

THE GREAT COMET OF 1843.—Now that the identity of the southern comet of the present year with that which excited such unusual attention in almost all parts of the globe in March, 1843, is pretty well established, it is not without interest to recall the circumstances under which the comet then made its appearance.

There were vague reports that the tail had been remarked before the perihelion passage (February 27) at Bermuda, Philadelphia, and Porto Rico on February 19, 23, and 26, and, according to Encke, the German newspapers had a notification from New York, that the comet was seen as early as February 5, and six days later was observed near β Ceti. These statements did not receive confirmation. The first definite observation of the head of the comet, and the only one previous to perihelion passage, was claimed to have been made by a Capt. Ray, and is described in a letter from Mr. Mitchell, of Nantucket, published by Prof. Peirce, the well-known American geometer. Capt. Ray is said to have been "a man of sound judgment, a very accurate observer, and correct man." He says he saw the comet nearly at midday at Concepcion, S.A.; at 11 a.m. its bearing from the sun was almost precisely east, with very little perceptible southing; "he did not measure the angle, his instruments being on board of the ship, some distance below the city; but he took great pains to estimate the apparent distance, and, being so near the sun, thinks he has done it very nearly," as Mr. Mitchell reported. The comet's "distance from the sun was only five minutes, or one-sixth of the sun's apparent diameter." It is not easy to understand how an object could have been detected without instruments, at a distance of only five minutes from the sun's limb, and it is certain that the elements which represent the observations after perihelion very closely, place the